Polarkoordinaten

(1) kartesisch: $\vec{F} = 150 \cdot \frac{\vec{v}}{v}$

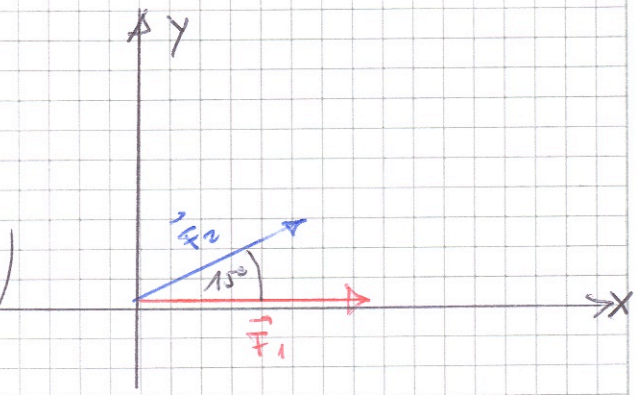
$$= \frac{150}{\sqrt{1.5^2 + 2^2}} \begin{pmatrix} 1.5 \\ 2 \end{pmatrix}$$

$$\frac{150}{\sqrt{6.25}} \begin{pmatrix} 1.5 \\ 2 \end{pmatrix} = \frac{150}{2.5} \begin{pmatrix} 1.5 \\ 2 \end{pmatrix} = 60 \begin{pmatrix} 1.5 \\ 2 \end{pmatrix} = \underline{\underline{\begin{pmatrix} 90 \\ 120 \end{pmatrix} N}}$$

polar: $\vec{F} = (150N, \arctan(\frac{2}{1.5}))$

$$\underline{\underline{\vec{F} = (150N, 53.13°)}}$$

(2) Lege $\vec{F}_1$ auf x-Achse;



$\vec{F}_1 = (60N, 0°) = \begin{pmatrix} 60 \\ 0 \end{pmatrix} N$

$\vec{F}_2 = (80N, 15°) = 80 \cdot \begin{pmatrix} \cos 15° \\ \sin 15° \end{pmatrix}$

$\vec{F}_1 + \vec{F}_2 = \begin{pmatrix} 60 + 80 \cdot \cos 15° \\ 80 \cdot \sin 15° \end{pmatrix}$

$|\vec{F}_1 + \vec{F}_2| = 138.827N, \quad \alpha = \arctan\left(\frac{y}{x}\right) = 8.577°$

$$\underline{\underline{\vec{F}_{Res} = (138.827N, 8.577°)}}$$

(3) $\vec{F}_3$ auf x-Achse;

$\vec{F}_1 = (80N, 120°) = 80 \cdot \begin{pmatrix} \cos 120° \\ \sin 120° \end{pmatrix}$

$\vec{F}_2 = (50N, 45°) = 50 \cdot \begin{pmatrix} \cos 45 \\ \sin 45 \end{pmatrix}$

$\vec{F}_3 = (100N, 0°) = 100 \begin{pmatrix} 1 \\ 0 \end{pmatrix}$; $\begin{pmatrix} \cos 0° \\ \sin 0° \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

$$\vec{F}_{Res} = \begin{pmatrix} 95.355 \\ 104.637 \end{pmatrix} = \underline{\underline{(141.568N, 47.657°)}}$$

(4) $\vec{F}_{Res} = (48N, 63.068°)$

(5) $\vec{F}_1 = (F_1, 45°)$, $\vec{F}_2 = (F_2, 120°)$

$= F_1 \begin{pmatrix} \cos 45° \\ \sin 45° \end{pmatrix}$ $= F_2 \begin{pmatrix} \cos 120° \\ \sin 120° \end{pmatrix}$

$\vec{F}_{Res} = (100N, 60°) = 100 \cdot \begin{pmatrix} \cos 60° \\ \sin 60° \end{pmatrix}$

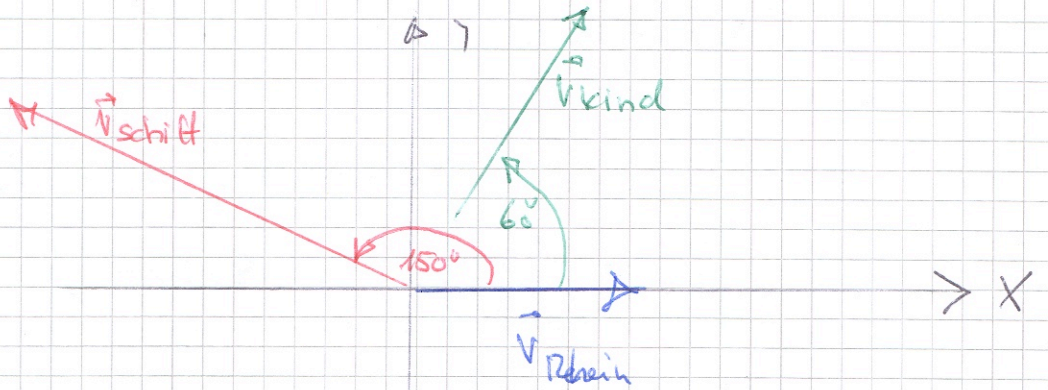
$F_1 \cdot \begin{pmatrix} \cos 45° \\ \sin 45° \end{pmatrix} + F_2 \begin{pmatrix} \cos 120° \\ \sin 120° \end{pmatrix} = 100 \begin{pmatrix} \cos 60° \\ \sin 60° \end{pmatrix}$

$F_1 = 89.658N$; $F_2 = 26.795N$

(6) $\vec{F}_{Res} = \begin{pmatrix} 106.802 \\ 253.398 \end{pmatrix} = (274.985N, 67.146°)$

$F_a = 199.031N$, $F_b = 133.515N$

(7)



$\vec{v}_{Rhein} = (1 \frac{m}{s}, 0°) = \begin{pmatrix} 1 \\ 0 \end{pmatrix} \frac{m}{s}$

$\vec{v}_{Kind} = (5 \frac{m}{s}, 60°) = 5 \cdot \begin{pmatrix} \cos 60° \\ \sin 60° \end{pmatrix} \frac{m}{s}$

$\vec{v}_{Schiff} = (6 \frac{m}{s}, 150°) = 6 \cdot \begin{pmatrix} \cos 150° \\ \sin 150° \end{pmatrix}$

$\vec{v}_{Res} = \begin{pmatrix} -1.696 \\ 7.33 \end{pmatrix} \frac{m}{s}$;

$\vec{v}_{Res} = (7.524 \frac{m}{s}, 103.027°)$